many observers saw this as a clear indication of the merits of deregulation, paving the way for passage of the Airline Deregulation Act in the fall of 1978.

The good times did not last very long. Airlines are a fuel-intensive industry, and demand for airline services is quite sensitive to economic growth. In 1979, events in the Middle East led to a doubling of fuel prices; with their costs increasing rapidly, airlines increased fares. In 1980, the economy entered a recession, followed by yet another recession in 1981. The combination of higher fares and negative economic growth led to declining airline traffic in both 1980 and 1981. The industry had not experienced negative traffic growth in two successive years since World War II.

Proliferation (1980-1985)

Fare liberalization was not entirely new; the CAB had loosened the regulation of fares in previous periods. A more significant break with the past was the dismantling of government barriers to entry, both for new carriers seeking to enter the industry and for existing carriers seeking to enter new routes. The Airline Deregulation Act permitted the CAB to disapprove a carrier's application for new route authority only if an incumbent carrier could demonstrate that entry by a competitor would not be consistent with public convenience and necessity. Since this was a difficult standard for incumbents to meet, the CAB awarded carriers the authority to serve virtually any domestic route within 60 days of their application.9/ This provision also paved the way for new carriers to enter the industry. (The era of free entry had a brief hiatus beginning in 1981, when the FAA had to restrict airline operations after a strike led to the firing of three-quarters of the nation's air traffic controllers.)

New Entrants. Shortly after the Congress enacted the Airline Deregulation Act, intrastate carriers like Southwest and PSA, along with charter carriers like Capitol and World, quickly began interstate service. They were followed by entirely new carriers such as Midway,

9. Previously the burden of proof had been on the entrant. Beginning in 1979, virtually the only cases in which the CAB did not confer the requested route authority were those involving environmental problems at an airport--most notably, community concerns about noise.

People Express, and America West Airlines. For the most part these carriers had significantly lower costs than the regulated carriers. Their cost advantage stemmed in part from the fewer service amenities they offered--such as less space between seats and minimal food service. More important, they did not inherit the high wage rates and restrictive work rules of the formerly regulated carriers. Regulation had produced relatively high labor costs because it tended to inhibit price cuts reflecting the lower operating costs of new generations of aircraft. With the introduction of jets during the 1960s, these cost savings had been substantial, and airline employees had managed to capture a significant share of them.10/

The lower costs of the new entrants enabled them to undercut prevailing fares by significant amounts. As passengers gladly accepted reduced service amenities in return for lower fares, the formerly regulated carriers were forced to match the prices of their new competitors.

Local-Service Carriers. Increased competition also came with the entry of formerly regulated carriers into new routes. Under regulation, the local-service carriers had become significant regional operators of jet equipment, but the CAB had largely restricted each of these carriers to serving a specific geographic region. With deregulation, they began flights to many new markets outside of their historic regions and proved to be formidable competitors. Their new services were especially attractive to passengers who had to make connections en route to their destinations.

Fewer than 5 percent of the 50,000 city-pairs between which people in the United States fly receive nonstop service. The other markets simply do not have enough traffic to support nonstop flights in efficient-sized jet aircraft. When passengers change planes, they generally prefer not to change airlines. They believe that staying on the same airline reduces the probability of missing a connecting flight

10. See, for example, Bailey, Graham, and Kaplan, *Deregulating the Airlines*, pp. 95-102. For evidence of the effect of regulation on labor compensation in another industry, see Nancy Rose, "Labor Rent Sharing and Regulation: Evidence from the Trucking Industry," *Journal of Political Economy* (November/December 1987), pp. 1146-1178.

or losing baggage. Single-carrier service also increases convenience by helping to avoid long walks between terminals at an airport.11/

Under regulation, most passengers from a small or medium-sized community flew on a local-service carrier to a nearby major city, where they often had to switch to a trunk airline. With the introduction of service to more major cities, the local-service carriers could offer single-carrier service to an increasing number of these passengers. To maximize the connecting possibilities, these carriers would schedule flights from various cities to arrive at a hub airport at about the same time. After an interval for passengers and their baggage to change planes, the flights would proceed to their ultimate destinations. With this hub-and-spoke route system, a carrier could serve many more city-pair markets than if it only offered one-stop flights.12/

Trunks. The trunks initially bore the brunt of the competitive pressures from local-service carriers and new entrants. Before the Airline Deregulation Act, the trunks had controlled nearly 90 percent of domestic air traffic. By 1985 that share had fallen to 72 percent, and two of the trunk carriers--Braniff in 1982 and Continental in 1983--had gone bankrupt.13/ On the other hand, more than 20 new carriers had begun interstate service with jet equipment by 1985.

The new entrants offered lower fares than the trunks, and the local-service carriers offered more convenient service. The trunks responded by renegotiating labor contracts in order to reduce their costs. They also reconfigured their routes into hub-and-spoke networks that allowed them to deploy their aircraft more effectively. The trunks also developed frequent flyer programs as a way of building brand loyalty among business travelers. Several of them also aggressively marketed computer reservation systems that encouraged travel agents to recommend their flights. Yet, among the trunks only the largest were truly profitable.

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11. Consequently, online connecting service is more valuable to passengers. See Dennis Carlton, William Landes, and Richard Posner, "Benefits and Costs of Airline Mergers: A Case Study," *Bell Journal of Economics* (Spring 1980), pp. 11/65-11.83.

12. For a fuller discussion of this topic, see Chapter II.

13. Continental used its bankruptcy to abrogate its labor contracts. It resumed operation after a weekend by rehiring many of its employees at lower wages and with more flexible work rules. Braniff resumed operation in 1984 with a different management and different employees.

Consolidation (1985-1987)

The survival rate of the new entrants was not very good. Only one of the four former intrastate carriers, and only a handful of the newly formed carriers, were still operating independently in 1988 (see Table 1).14/ Several of them were acquired by other carriers. Some would probably not have continued to operate if they had not been acquired.

Problems of the New Entrants. The previously noted responses of the incumbents to the increased competition were an important reason that so many new entrants exited the industry. Changes in the pricing strategies of the incumbents were also important. At first they simply matched the new entrants' fares, but this did not prove to be an effective strategy. When both the incumbent and new entrant charged the same price, most passengers opted for the brand-name carrier. Often, however, the incumbent could not cover its costs at the reduced fare. Moreover, if the incumbent did not increase its capacity, the lower fares could stimulate enough traffic to fill the flights of both the incumbent and the entrant; then, despite the losses incurred by the incumbent, the new entrant would still be profitable.

Over time, the former trunks found less costly ways of responding to the new entrants.15/ Instead of cutting fares across the board, they reduced only those restricted discount fares used by the most price-sensitive passengers. They also limited the number of seats they would make available at the reduced fares. In some cases, these discounted fares undercut the prices of the new entrants. Thus, restricted discount fares, which had heralded the start of the deregulation process, became an effective weapon against competition from low-cost carriers. The incumbents also tailored their capacity, scheduling flights to depart near the entrants' scheduled departure times and assuring that they had sufficient capacity to accommodate the traffic stimulated by the lower fares.

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14. Presidential Airline, which started service in 1985, now operates under the name of United Express and largely provides feeder service for United Airlines. There are also a number of commuter carriers that began jet service under deregulation.

15. For a fuller discussion of these issues, see Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy and Public Policy," *Yale Journal on Regulation* (Spring 1987), pp. 472-478.

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TABLE 1. NEW ENTRANTS INTO INTERSTATE SERVICE
(Selected carriers)

Carrier	Year Entered	Year Exited	Reasons for Exiting
		Former Intrastates	
Air California	1979	1987	Acquired by American
Air Florida	1979	1984	Failed
Pacific Southwest	1979	1987	Acquired by USAir
Southwest	1979	Still operating	
		Former Charter Carriers	
Capitol	1979	1984	Failed
World	1979	1986	Ceased scheduled passenger service
		New Carriers	
Air Atlanta	1984	1987	Failed
Air One	1983	1984	Failed
American International	1982	1984	Failed
America West	1983	Still operating	
Braniff (new)	1984	Still operating	
Florida Express	1984	1988	Acquired by Braniff
Hawaii Express	1982	1983	Failed
Jet America	1981	1987	Acquired by Alaska Air
Midway	1979	Still operating	
Muse	1981	1985	Acquired by Southwest
Northeastern	1983	1985	Failed
Pacific East	1982	1984	Failed
Pacific Express	1982	1984	Failed
People Express	1981	1986	Acquired by Texas Air
Presidential	1985	Still operating	
Regent Air	1985	1986	Failed

SOURCE: Congressional Budget Office, from Department of Transportation data.

NOTE: Some of the acquired carriers continue to operate under their own names.

The discount fares had advantages besides meeting low-cost competition. Effective management of the size of the discounts, as well as flight-by-flight management of the number of seats made available at each fare, enabled carriers to fill a high proportion of their seats while assuring time-sensitive passengers a high probability of getting seats on their preferred flights. The resulting increases in load factors were important in reducing average costs.

Hub-and-spoke route networks also proved to be an effective deterrent to entry by low-cost carriers. Many passengers must make intermediate stops en route to their ultimate destinations. And conversely, on all but the densest routes, carriers must carry significant amounts of connecting traffic. As a result, with a relatively few exceptions, carriers must operate their flights as part of a hub-and-spoke route network. Thus it became quite difficult for a new carrier to enter the industry by serving a few markets and then gradually expanding.16/ The start-up costs for a new carrier proved to be greater than many of the advocates of deregulation expected.

Not all of the formerly regulated carriers managed to adapt easily to the new environment. The smaller of the trunks were the most adversely affected. Two of them went bankrupt and several others significantly contracted their domestic operations. Although the local-service carriers as a group performed well, those that hubbed at the same airports as a trunk carrier generally did less well.

At the start of deregulation, smaller carriers had the flexibility and low costs that enabled them to respond quickly to market opportunities. There now seems reason to believe that the larger carriers have a number of significant advantages in competing in the deregulated industry (see Chapter II). However, several new entrants--most notably America West, Midway, and Southwest--seem to have established viable niches in the industry.

Mergers. Changing perceptions as to the advantage of size may have been an important factor in the wave of mergers over the past several years (see Table 2). In addition, some in the airline industry apparently believed that the Department of Transportation would be more

16. See Elizabeth Bailey and Jeffrey Williams, "Sources for Economic Rent in the Deregulated Airline Industry," *The Journal of Law and Economics* (April 1988), pp. 173-202.

TABLE 2. MERGERS AND ACQUISITIONS INVOLVING FORMERLY REGULATED CARRIERS

Year	Carriers
1979	North Central and Southern (name changed to Republic) Pan Am and National
1980	Republic and Hughes Air West
1981	Texas International and Continental
1985	People Express and Frontier
1986	Delta and Western Texas Air and Eastern (Texas Air also owns Continental) Texas Air and People Express Northwest and Republic TWA and Ozark Alaska and Jet America
1987	USAir and Pacific Southwest American and Air California USAir and Piedmont

SOURCES: Congressional Budget Office; Federal Trade Commission, *The Deregulated Airline Industry* (January 1988).

sympathetic to merger proposals than the Civil Aeronautics Board had been.17/ Since the department's authority over mergers began in 1985 and is scheduled to lapse in 1989, carriers may have seen this as a relatively narrow window of opportunity. Following the merger wave and the exit of most of the new entrants, the industry has become more concentrated than it had been under regulation (see Table 3). Moreover, the share of traffic controlled by the largest one or two carriers has increased at most airports.

Yet, few of the mergers raised significant competitive issues. In fact, the average number of carriers providing service in a single market has increased significantly since 1978.18/ While there has

17. See testimony of Julius Maldutis before the Senate Committee on Commerce, Science, and Transportation, November 4, 1987. Mr. Maldutis is a vice president at Salomon Brothers, Inc., an investment banking firm.

18. For information on the changes in the number of carriers between 1978 and 1983, see Civil Aeronautics Board, *Implementation of the Provisions of the Airline Deregulation Act of 1978* (January 31, 1984), p. 14. For subsequent information, see Table 4 of this report.

TABLE 3. STRUCTURE OF THE DOMESTIC AIRLINE INDUSTRY
(In percentages of revenue passenger miles)

1978		1983		1987	
Carrier	Percent of Revenue Passenger Miles	Carrier	Percent of Revenue Passenger Miles	Carrier	Percent of Revenue Passenger Miles
1. United	21.1	1. United	18.7	1. Texas Air	20.3
2. American	13.5	2. American	13.8	Continental	10.2
3. Delta	12.0	3. Eastern	11.1	Eastern	10.1
4. Eastern	11.1	4. Delta	11.1	2. United	17.3
5. TWA	9.4	5. TWA	7.1	3. American	15.4
6. Western	5.0	6. Republic	4.2	4. Delta	13.0
7. Continental	4.5	7. Northwest	4.2	5. USAir	8.9
8. Braniff	3.8	8. Western	3.9	USAir	4.0
9. National	3.6	9. Continental	3.5	Piedmont	3.5
10. Northwest	2.6	10. Pan Am	3.3	PSA	1.4
11. USAir	2.2	11. Southwest	1.7	6. Northwest	7.9
12. Frontier	2.0	12. Frontier	1.7	7. TWA	6.4
				8. Southwest	2.5
				9. America West	1.8
				10. Pan Am	1.6
				11. Braniff (New)	1.0
				12. Alaska	0.9
Top Four	57.7	Top Four	54.7	Top Four	66.0
Top Eight	80.4	Top Eight	74.1	Top Eight	91.7
Top Twelve	90.8	Top Twelve	84.3	Top Twelve	97.0

SOURCE: Congressional Budget Office, from Department of Transportation data and annual reports.

NOTE: Northwest was on strike for part of 1978. Data for 1987 reflect mergers of American with Air California and USAir with Piedmont and PSA, even though operations were not affected for the entire year.

been a substantial increase in industry concentration since 1983, there has not been a corresponding increase in concentration at the market level. On average, the effective number of carriers serving markets of more than 200 miles with 25 or more passengers a day has even increased slightly.19/ It has grown from 2.4 carriers in 1983 to

19. A common way to measure market concentration is with the Herfindahl Index. It is computed by squaring each firm's market share and summing over all the firms. The index ranges from virtually zero--when each firm has a very small share--to one when there is a monopoly. The reciprocal of the Herfindahl is the number of equal-sized competitors that would produce the same amount of competition that is observed in the market. For example, if one firm has a share of 0.5, two firms have shares of 0.2 each, and a fourth a share of 0.1, the Herfindahl Index is 0.25 + 0.04 + 0.04 + 0.01 = 0.34. The reciprocal of this number (1 divided by 0.34) is approximately 3, meaning that three firms with equal shares would produce the same index of competition. In computing the effective number of firms, this paper used the weighted average of the reciprocals of the Herfindahls.

2.5 carriers in 1987.20/ This is true not only in the densest markets, but in markets of varying densities and distances (see Table 4). 21/

Only if one considers passengers using single-plane service--that is, excluding connecting service--has the effective number of carriers declined. From 1983, it fell by 3 percent to 1.9 carriers in 1987. On average, longer-haul markets have experienced an increase in the number of carriers providing single-plane service, while shorter-haul markets have experienced a slight decrease.

THE SAFETY ISSUE

Deregulation did not apply to government safety rules. The Federal Aviation Administration has continued to monitor airline maintenance personnel and procedures, as well as flight crew qualifications. Nevertheless, some critics have charged that before deregulation the airlines provided more safety than the FAA required whereas now they provide only the amount mandated by the government.22/ Despite declines in both the number of accidents and the accident rate, concern over the impact of deregulation on airline safety persists.

One of the major goals of deregulation was to increase competition. Without fare and route regulation, carriers have no protection from lower-cost competitors, and thus deregulation has increased the importance of maintaining low costs. One way for airlines to reduce costs, of course, would be to reduce the amount of maintenance they perform on their aircraft. They could also employ less qualified, and therefore presumably lower-paid, pilots and maintenance personnel.

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20. A number of mergers were consummated after the first quarter of 1987. The data have been adjusted to reflect American's acquisition of Air California, Alaska's acquisition of Jet America, and USAir's acquisition of both Piedmont and PSA.

21. Moreover, a carrier on one route may compete with a carrier serving another route. For example, depending on the relative fares, a passenger may decide to vacation in Florida or in California. Carriers on short-haul routes must also compete with surface transportation, most notably by car.

22. See, for example, J. Glen Moore, "Aviation Safety: Maintaining Safety in a Deregulated Environment," Congressional Research Service, May 12, 1988.

TABLE 4. EFFECTIVE NUMBERS OF FIRMS SERVING CITY-PAIR MARKETS (Weighted Averages by Year, Distance, and Passenger Density)

Year (First quarter)	Miles Between Cities 200-500	501-1,000	1,001-1,500	1,501-2,000	Over 2,001
25-50 Passengers per Day					
1983	1.24	1.57	1.93	2.37	1.82
1987	1.57	1.93	2.25	2.71	2.53
1987[a]	1.45	1.88	2.23	2.70	2.52
51-200 Passengers per Day					
1983	1.43	1.89	2.22	2.27	2.17
1987	1.44	2.09	2.61	2.91	2.84
1987[a]	1.36	2.04	2.56	2.90	2.84
201-500 Passengers per Day					
1983	1.50	2.25	2.46	2.30	2.46
1987	1.65	2.11	2.55	2.75	2.94
1987[a]	1.61	2.06	2.52	2.72	2.94
501-1,000 Passengers per Day					
1983	1.90	2.25	2.43	2.45	2.88
1987	1.96	2.30	2.38	2.18	3.82
1987[a]	1.90	2.28	2.37	2.18	3.82
Over 1,000 Passengers per Day					
1983	2.33	2.80	2.67	2.83	3.85
1987	2.28	2.92	2.45	2.83	4.13
1987[a]	2.22	2.92	2.45	2.83	4.13
All Densities					
1983	1.81	2.15	2.43	2.42	2.72
1987	1.86	2.26	2.48	2.69	3.27
1987[a]	1.80	2.23	2.46	2.67	3.27
Average for All Markets					
1983	2.40				
1987	2.52				
1987[a]	2.49				

SOURCE: Congressional Budget Office, from the Department of Transportation's Origin and Destination Survey.

NOTE: Includes all direct and one-stop flights. Companies that control more than one carrier are considered to be one airline. The effective number of firms is the reciprocal of the Herfindahl Index of the relevant market weighted by revenue passenger miles. (The Herfindahl Index is computed by squaring each firm's market share and summing for all firms.)

a. Reflects mergers that were consummated after the first quarter of 1987.

But carriers have a compelling reason to maintain their aircraft properly even without government regulation: passengers are reluctant to travel on unsafe airlines. If a carrier experienced a rash of accidents, passengers would avoid its flights and--since aircraft maintenance expenses represent less than 10 percent of airline operating expenditures--the resulting fall in revenues would quickly overwhelm any cost savings from reduced maintenance.23/

The Congress regulates safety in order to make certain that carriers devote sufficient resources to maintaining their aircraft. It is possible that the airlines chose to perform more maintenance than the government required during regulation, but do not do so now, although there is no support for this in the accident statistics. In fact, the number of fatal accidents per departure declined more than 50 percent between the last eight years of the regulated era (1970-1978) and the first eight years of the deregulated era (1979-1987).24/

THE OUTLOOK UNDER DEREGULATION

Airline deregulation has led to a more efficient industry, providing lower-priced transportation to the vast majority of air travelers. This is precisely why the Congress deregulated the industry. Deregulation has also produced another dividend that may be even more important: improved service convenience. The hub-and-spoke system has made connections much easier in the vast majority of markets that cannot support nonstop service. The hub-and-spoke networks also provide

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23. This might not be true of a carrier that was close to bankruptcy. In that case, the savings from reduced maintenance could help stave off failure. One study found some indication of a negative relationship between profit margins and the incidence of accidents among smaller operators of jet aircraft. The study included data from both the regulated and deregulated eras. There is no evidence that such carriers are more likely to have higher accident rates with deregulation than they had under regulation. See Nancy Rose, "Financial Indicators and Airline Accident Performance: An Economic Assessment," MIT School of Management, November 1987.

24. See Aviation Safety Commission, *Final Report and Recommendations* (April 1988). For a more extensive discussion of accident statistics, see John Ogur, Curtis Wagner, and Michael Vita, *The Deregulated Airline Industry: A Review of the Evidence*, Federal Trade Commission (January 1988), pp. 61-74. For reports of statistical analyses that failed to find an adverse effect on safety caused by deregulation, see Richard McKenzie and William Shugart, "Deregulation and Air Travel Safety," *Regulation*, no. 3/4 (1987), pp. 42-47; and Steven Morrison and Clifford Winston, "Air Safety, Deregulation, and Public Policy," *The Brookings Review* (Winter 1988), pp. 10-15.

increased competition from connecting airlines in markets that are receiving nonstop service. Single-carrier connections are especially important to passengers in smaller cities, since they reduce travel times for those who must change planes en route to their destinations. One study concluded that in 1983 the time savings from the realigned route network were probably worth more to consumers than the savings from lower fares. It further estimated the total benefits of deregulation at roughly $6 billion in that year.25/

Yet, not everyone has benefited. The CAB deliberately kept fares below costs in short-haul and low-density markets; not surprisingly, prices on these routes have increased. Moreover, there is evidence that, other things being equal, the less competition in a city-pair market the higher the fares. There is also a wide variation in fares offered to different passengers traveling on the same flight. In fact, one study concluded that unrestricted coach fares, which accounted for only 10 percent of industry traffic in 1986, are much higher than they would have been had CAB-style regulation continued.26/ There is no evidence, however, that firms in the industry have earned profits in excess of a competitive level. During regulation, airline profitability, as measured by the return to stockholders' equity, was lower than in manufacturing. Moreover, operating profit margins, which provide an indication of how the airline industry's profitability has varied over time, have declined since deregulation (see Figure 4).

Although the vast majority of air travelers have benefited from airline deregulation, there are lingering concerns as to whether these gains will be permanent. Specifically, the unexpected reduction in the number of carriers has raised questions as to how aggressively the airlines will compete with each other in the future.

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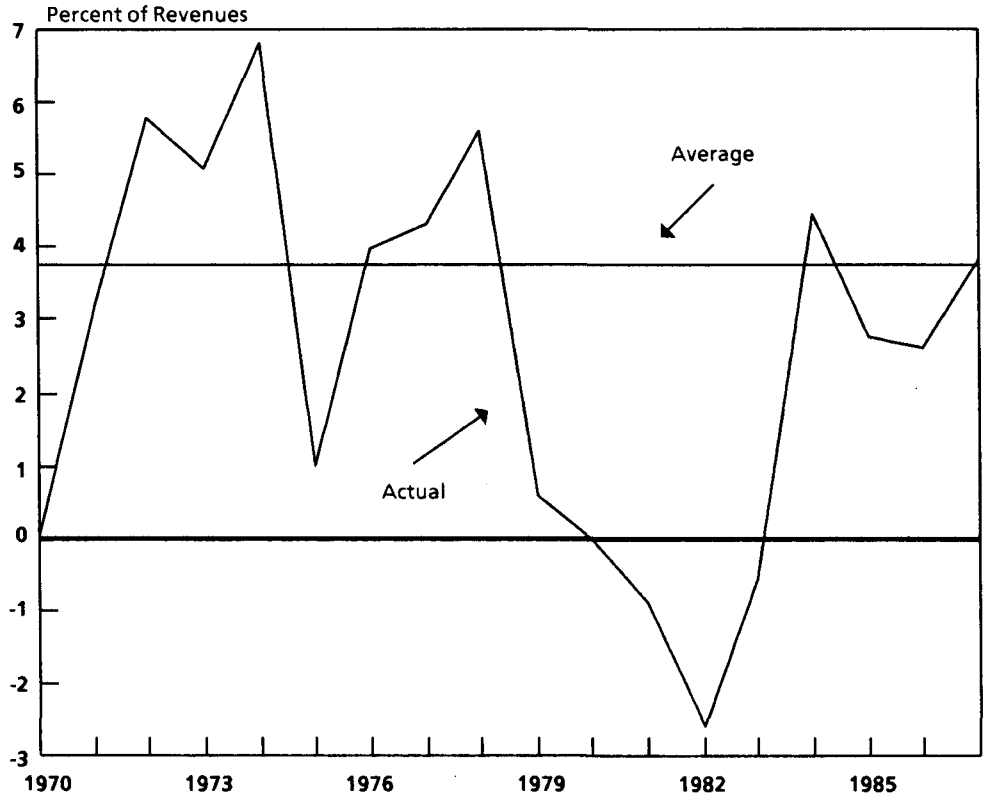
25. See Steven Morrison and Clifford Winston, *The Economic Effects of Airline Deregulation* (Washington, D.C.: Brookings, 1986), pp. 24-36.

26. It is, however, costly to provide convenient service to time-sensitive passengers. See Don Pickerell and Richard Horn, "Airline Fare Restructuring Since Deregulation," unpublished manuscript, Transportation System Center, Department of Transportation. Another study found that coach fares in 1984 had not increased more rapidly than they would have increased under regulation. See John Meyer and Clinton Oster, *Deregulation and the Future of Intercity Passenger Travel* (Cambridge, Mass.: MIT Press, 1987), pp. 112 and 113.

Some consolidation in the industry was probably inevitable. And government policies designed to spur competition may have little impact on industry concentration. The future performance of the industry may depend more on how effectively the government manages air traffic than on any conceivable reduction in industry concentration. Deregulation brought a rapid increase in traffic, and the sudden emergence of hub-and-spoke systems has tended to concen-

Figure 4.
Operating Profit Margins on Domestic Operations
Actual vs. Average Under Regulation



SOURCE: Congressional Budget Office, from Department of Transportation data.

NOTE: Intrastate carriers not included prior to 1979.

The average under regulation is the average operating profit margin between 1970 and 1977.

trate traffic peaks at particular airports and at particular times of the day. The result has been a substantial increase in traffic delays and a resort to ad hoc methods of dealing with congestion. Unless the government does a better job of managing its provision of air traffic services, a significant part of the gains of deregulation may be lost.

CHAPTER II

THE INDUSTRY'S CONSOLIDATION

Before deregulation, most analysts thought that the economies of scale in the industry were relatively modest.1/ They believed that--for the trunk airlines, and for at least the largest local service carriers--an increase in size would not significantly reduce the unit costs of providing service. That being so, small carriers could profitably compete with larger carriers. But while an airline's size may not have much effect on the cost of operating aircraft, size may be important in helping it to fill the aircraft with passengers. Securing advantages of size was apparently one factor behind the recent merger wave.

ADVANTAGES OF SIZE

The average cost of providing air service depends critically on the percentage of seats on a flight that are filled. Most analyses of economies of size, however, essentially assume that the size of an airline has little effect on its ability to fill seats.2/ With deregulation, the airlines developed new ways of doing business: hub-and-spoke route systems, frequent flyer programs, and computer reservation systems became important parts of the competitive landscape. These innovations have significantly influenced the ability of carriers to affect demand for their services. And large carriers have been able to use them most effectively.3/

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1. See, for example, Alfred Kahn, "Surprises of Airline Deregulation," *American Economic Review* (May 1988), pp. 316-322.

2. See Douglas Caves, Laurits Christiansen, and Michael Tretheway, "Economies of Density versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ," *The RAND Journal of Economics* (Winter 1984), pp. 471-490. Their study includes data from both the regulated and deregulated eras.

3. To an important extent these factors affect the economies of scope of providing airline service; because of them the cost of serving a given market is reduced if a carrier adds service in other markets. For a discussion of the role that these and other factors have had in shaping the deregulated airline industry, see Michael Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy and Public Policy," *Yale Journal on Regulation* (Spring 1987), pp. 393-494.

Hub-and-Spoke Route Systems

Because of the importance of connecting traffic, as well as passengers' strong preference for single-carrier service, airlines have had to adopt hub-and-spoke route systems in order to be viable competitors. At an airline hub, as many as 40 flights may arrive within a relatively short period of time. After exchanging passengers and transferring baggage, the aircraft proceed to their ultimate destinations.

A carrier's size is important in operating an efficient hub-and-spoke network. Increasing the number of flights has a geometric impact on the number of city-pairs a carrier serves through its hub. Consider a carrier operating a hub where 10 aircraft arrive en route to 10 other cities. A passenger on any arriving flight can continue on to any of those cities. A passenger on a flight from San Francisco, for example, can proceed to Washington, Philadelphia, New York, or seven other cities on the east coast. Similarly, passengers traveling from other west-coast cities can make connections to the same 10 east-coast cities. Ten flights operating through a hub, therefore, can offer connecting or one-stop service in 100 city-pair markets, plus nonstop service in 20 city-pair markets. If the carrier adds 10 additional flights with an intermediate stop at the carrier's hub, the number of connecting or one-stop city-pairs served increases to 400: passengers on flights from each of 20 origins can choose among 20 destinations. Thus doubling the number of flights quadruples the number of city-pairs served through the hub. With an increase in the number of possible destinations, the number of passengers per flight increases as well. This, in turn, reduces unit costs, because it allows the carrier to use larger air-craft and fill a higher percentage of its seats.

The number of flights offered in each city-pair also affects the viability of a carrier's hub. Up to some critical number of flights, carriers with the most service in a market tend to get a disproportionately large share of the traffic. There is direct evidence of this phenomenon in nonstop markets, and it presumably applies to connecting service as well.4/ Passengers reasonably expect carriers with

4. See Elizabeth Bailey, David Graham, and Daniel Kaplan, *Deregulating the Airlines* (Cambridge, Mass: MIT Press, 1985), pp. 166-171. For a discussion of other factors that encourage passengers to book passage on carriers offering a wide selection of flights in a market, see Michael Levine, "Airline Competition in Deregulated Markets," pp.443-444.

the most flights in a market to be the most likely to have a flight at or near a desired departure time, and tend to contact those carriers first. Moreover, most fares require passengers to book both legs of a round-trip flight on the same carrier. This not only provides further incentive for passengers to contact the leading carrier, but also provides travel agents with an incentive to recommend the flights of that carrier.5/

A carrier has to be fairly large in order to operate a hub at a major airport, because it must offer relatively frequent service in a large number of cities.6/ There are only a handful of airports where more than one carrier operates a hub, and there are currently none where more than two carriers do so.7/

At smaller cities, a carrier can operate a hub with fewer flights. But to be successful, a carrier must offer connecting passengers relatively frequent service. Most connecting passengers can choose among a variety of airports at which to make their intermediate stops. Although carriers at different hubs do not operate nonstop flights in competition with one another, they nevertheless offer connecting service in many of the same markets. An Oklahoma City passenger traveling to Washington, D.C., for example, can connect at Atlanta, Dallas, Memphis, and several other airports.

An airline may be able to lower its unit costs by operating more than one hub--in other words, having a second hub at a different airport may reduce a carrier's cost of operating the first hub. There are two reasons for this. First, a carrier can serve many of the same cities from both hubs. Piedmont, for example, offers flights from Boston to its hubs at both Baltimore and Charlotte. Certain fixed costs--such as maintaining a station and advertising--are associated with serving

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5. A travel agent must find an acceptable time for both the outbound and return flights. If a carrier for the outbound flight does not offer a convenient return, the agent has to recommend another outbound carrier. Recommending the carrier with the most flights increases the probability of quickly finding convenient flights for both segments.

6. See, for example, Michael Levine, "Airline Competition in Deregulated Markets," pp. 444-445. Also see Elizabeth Bailey and Jeffrey Williams, "Sources of Economic Rent in the Deregulated Airline Industry," *Journal of Law and Economics* (April 1988), pp. 173-202.

7. See Table 5 on page 35 of this report for the relevant data in 1985. While three carriers operated hubs at Denver in 1985, only two operate hubs there now. Frontier, which ran into financial difficulties, was acquired by People Express, which was then acquired by Continental.

any city. By operating a second hub, a carrier may be able to increase operations at the "spoke" cities that it is already serving without a proportionate increase in costs. Operating an additional hub may also give a carrier added flexibility in scheduling its flights. When a carrier operates a hub-and-spoke route network, virtually all of its flights either originate or terminate at the hub airport, although some flights may make intermediate stops. Yet, the spokes can be of dramatically different distances. United serves both Los Angeles and Des Moines from its Chicago hub. If a carrier has only one hub, this may require that some aircraft spend substantial time on the ground at the spoke airport or else operate on relatively unprofitable tag-end segments. Thus, adding hubs may permit more efficient scheduling of both aircraft and crews.

Frequent Flyer Programs

In the early years of deregulation, the largest carriers--the trunks--faced competition both from expanding local service carriers and from low-cost new entrants. The trunks could not respond quickly to this outbreak of competition because they had fleets of large planes that could best be used in long-haul markets, and they had high operating costs. Despite the size and established reputation of the trunks, passengers appeared more concerned with fares and schedules when selecting flights. American Airlines developed the "frequent flyer" program as a means of creating a preference for its flights. Other carriers, large and small, copied American's idea, but the programs have proved most advantageous for the largest carriers.

A frequent flyer program is essentially a rebate in the form of free travel.8/ The airline does not issue the rebate, however, until the passenger purchases some minimum amount of service. As the passenger accumulates credits toward this minimum, the incentive to continue using that carrier increases until the rebate is received. Frequent flyer programs are thus an effective means of locking in a customer to the services of a particular carrier.

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8. For further discussion of this issue, see Severin Borenstein, "Hubs and High Fares: Airport Dominance and Market Power in the U.S. Airline Industry," Discussion Paper, Institute of Public Policy Studies, University of Michigan (March 1988).

Passengers generally find that carriers with the largest operations in their hometowns have the most attractive frequent flyer programs. The more extensive a carrier's route network, the more likely it is to serve the markets in which passengers travel, and the more quickly the rebates can be earned. In addition, the more cities that a carrier serves, the more likely it will offer desirable destinations for which passengers can use their rebates.9/

Methods of Influencing Travel Agent Recommendations

To compete effectively, airlines must be able to sell their services widely. Air transportation is quite perishable--an empty seat on a departed flight cannot be sold--and aircraft of efficient size are generally large relative to the number of people traveling at any given time. Moreover, the passengers on a flight tend to be from widely scattered locales, not only within the metropolitan areas of the flight's origin and destination but in other cities as well.

Travel agents have proved to be an effective way of marketing air transportation. The more than 25,000 travel agents dispersed throughout the country are convenient to much of the traveling public. Since travel agents represent virtually all the scheduled airlines, an airline does not have to establish a distribution system when it begins serving a new city. Because they represent virtually all of the carriers, agents have access to comprehensive fare and schedule information; as carriers' fares and routes in the deregulated environment have undergone frequent changes, passengers' demand for such comprehensive information has increased.

Not all passengers exhibit strong carrier preferences despite the efforts of the airlines to create brand loyalty. Even those who have preferences must periodically travel on other airlines, since no carrier serves all markets, and a preferred carrier may not have a flight at a desired time. For those reasons, airlines generally find it profitable to influence travel agents' recommendations. To do this they have developed both sophisticated commission rate structures and computer reservation systems. Because these systems enable their owners to

9. To make a frequent flyer program more attractive, a carrier can purchase from other carriers seats on flights to popular destinations that it does not serve, but this can be expensive.

monitor the behavior of agents, carriers that own computer reservation systems apparently obtain certain advantages in designing travel agent compensation plans.10/

Targeting Commission Rates. Other things being equal, agents will tend to recommend the airline that pays them the most. The return to a carrier from an across-the-board increase in travel agent commissions tends to be small, however, since other carriers can quickly match the increase. Moreover, the higher rate has to be paid for sales the agents would have made in any case.11/

As a result, airlines have increasingly targeted the payment of travel agent commissions to cases in which the agents can influence the flights passengers select. For example, an airline may estimate the number of flights an agent is likely to book during any period and pay higher commission rates--a "commission override"--for bookings above that number. Commission overrides generally apply to total agent sales, but they can also be targeted at particular markets and particular flights.12/ Such targeting can be especially important when a carrier promotes a new service or responds to new competition.

Overrides tend to be less costly to large carriers than to smaller carriers.13/ Passengers will frequently request the larger carrier's flights because of its accepted brand name and its full schedule of flights. Hence, it will need to pay overrides on a relatively small share of its bookings to influence travel agent behavior. In contrast, a smaller carrier with a smaller presence in a city will often have to pay overrides on a much larger share of its bookings.

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10. See, for example, Michael Levine, "Airline Competition in Deregulated Markets," pp. 458-464.

11. An across-the-board increase in the commission rate is in some respects like a fare decrease: the carrier that initiates the change hopes that the additional traffic will more than compensate for the lower revenue from passengers who would have flown in any case. There is an important distinction, however: a fare decrease stimulates traffic, while in most cases, an increase in commission rates does not.

12. In some cases, commissions may be rebated by the travel agent to the purchaser. This is most likely to occur when agents sell to relatively large business accounts.

13. For a discussion of the impact on competition of such behavior, see Steven Salop and David Scheffman, "Raising Rivals' Costs," *American Economic Review* (May 1983), pp. 267-271.